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Commuting as a Work-Related Demand:

Effects on Work-to-Family Conflict, Affective Commitment and Intention to Quit

Achim Elfering[1,2*], Ivana Igic[1*], Ramona Kritzer[1],
& Norbert K. Semmer[1,2]

*Joint first author position

1 Department of Work and Organizational Psychology, University of Bern, Switzerland

2 National Centre of Competence in Research, Affective Sciences, University of Geneva, CISA, Geneva, Switzerland

Authors' Note: This study is based on data from the "Job-Stress-Index" project, a cooperation between the University of Bern, Applied University of Wintherthur (ZHAW), and Health Promotion Switzerland (*ger.* Gesundheitsförderung Schweiz), for which Swiss employees have been investigated yearly since 2014.

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Commuting time is the duration of the transition between the work and private (typically family) domains. The status of commuting in theories dealing with work-family issues or boundary management is not very clear. We discuss commuting taking a different perspective from literature (e.g., as a demand, source of time-based work-family conflict, impediment to the flexibility and permeability of the work-home boundary and as a resource for work-family boundary management), concluding that the demand aspects of commuting are dominant. From this perspective we analysed the association between the commuting time as a work-related demand at baseline and work-family conflict (WFC), affective commitment (AC) and intention to quit (ITQ) one-year later (N=838). We assessed commuting time objectively, by using Google Maps to estimate travel time based on postal codes of home and workplace. As expected, longer commuting predicted all three outcomes. Furthermore, autonomy - manifested in flexible work arrangements - moderate these effects for two out of three outcome variables: Temporo-spatial autonomy reduced the positive associations between commuting time and WFC and ITQ. The effect sizes were small, however, effects were adjusted for baseline levels of the relevant outcome, demographic variables and several work and private stressors.

Keywords: commuting, work-to-family conflict, intention to quit, affective commitment.

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Commuting to and from work is part of employees' everyday life and although it is linked to work, it is typically neither compensated financially, nor included in work time. On average the duration of the commute is increasing in many countries (Kirby & LeSage, 2009; Koslowsky, Aizer, & Krausz, 1996; Schneider & Limmer, 2008), including Switzerland, where we have conducted current study. According to the Swiss Federal Statistical Office (Bundesamt für Statistik; BFS, 2015), the duration of the average commute in one direction increased from 23 to 30 minutes between 2000 and 2013, and the percentage of "longer commutes" (>60 minutes) increased from 2.4% to 10% between 1990 and 2013 (BFS, 2015). The trend towards longer commutes in Switzerland is similar to other countries. These developments have implications for transport policy, economics and ecology (e.g., Muñiz & Galindo, 2005).

Commuting time is the duration of the transition between the work and family domains. The theoretical status of commuting is not very clear, and not many scholars thematise commuting even when dealing with subject such as work-family issues (e.g., Powell & Greenhaus, 2006) or boundary management (e.g., Clark, 2000). When commuting is discussed, it is treated: as a demand (Koslowsky et al., 1996; Voydanoff, 2014); as a time-constraint that may induce time-based work-family spillover (Koslowsky et al., 1996), as an impediment to flexibility and permeability of the work-home boundary (Ashforth, Kreiner, & Fugate, 2000), but also as a resource for optimal management of the work-home boundary (Ashforth et al., 2000).

In this article, we discuss these ways of looking at commuting and conclude that commuting should primarily be regarded as a demand. We also argue that this demand is primarily work-related. From this discussion we derive hypotheses that commuting time should

be related to work-family conflict (WFC) and also to organisation-related variables such as organisational commitment and turnover intention. Furthermore, we postulate that the classic moderator in the job demands-control theory (Karasek, 1979), autonomy - specifically autonomy with regard to time and place of work (temporo-spatial autonomy) - should moderate these effects. These hypotheses were tested in a longitudinal study using objective data of commuting time. Within-domain demands and resources such as time pressure, job control, hours worked and shift work, and private demands were control variables.

With this study, we contribute to the literature in four ways. First, we contribute to the theoretical clarification of the multi-faceted nature of commuting. Second, we tested if commuting negatively predicts not only WFC, but also organisation-related outcomes, such as affective commitment (AC) and intention to quit (ITQ), which have been somewhat neglected in previous research. Third, we tested moderation hypothesis related to the time- and space-related nature of commuting, namely temporo-spatial autonomy. Finally, current study also makes methodological contributions to the literature, as we have used a longitudinal study design and rather to rely on self-reports, a more objective measure of commute time based on postal codes and estimated by using Google Maps.

Commuting to Work: Demand or Resource?

Commuting time, the duration of the transition between the work and the private (typically family) domain, is for the majority of employees a part of their daily life. Unfortunately, the majority of theoretical models of integration and separation of work and family fail to discuss explicitly commuting as an relevant phenomena (Frone, Yardley, & Markel, 1997; Powell & Greenhaus, 2006), as do the the meta-analyses on WFC and interference (e.g., Byron, 2005; Michel, Kotrba, Mitchelson, Clark, & Baltes, 2011). However, it does seem

to have received more attention in recent reviews (Allen, Cho, & Meier, 2014). Commuting is not mentioned in border theory (Clark, 2000),

Commuting is included as a "micro-transition" in boundary theory (Ashforth et al., 2000; Desrochers & Sargent, 2004) and in Voydanoff discussed commuting as a specific demand (Voydanoff, 2014). There is, however, no comprehensive theoretical account of commuting.

In current study, we see commuting as a multi-faceted phenomenon that may be looked at from four different theoretical angles, that is: 1) as a demand, 2) as a source of WFC, because commuting time might limit the disposable time for private matters, which is described as time-based spillover in WFC, 3) as a constraint on the flexibility and permeability of the work-home boundary and 4) as a resource for good boundary management.

Commuting as a demand. For many the most salient feature of commuting is that it creates additional demands and constitutes a stressor (e.g., Koslowsky et al., 1996; Stutzer & Frey, 2008). Many authors do not explain why they consider commuting a demand, and when they do, they often refer to hassles that are frequently, but not necessarily, associated with commuting, such as traffic jams (e.g., Koslowsky et al., 1996; Stutzer & Frey, 2008). From the perspective of job demands-control theory (Theorell & Karasek, 1996) and its extension, the job demands-resources theory (Bakker & Demerouti, 2016) as well as from the perspective of the Conservation of Resources (COR) model (Hobfoll & Shirom, 2001) commuting may be defined as a demand because it requires effort and consumes resources.

At the same time, it is difficult to assign commuting to a particular life domain. Should it be regarded as part of the work domain, the family domain or the boundary zone?

For instance, in their study on demands from various domains, Peeters, Montgomery, Bakker, and Schaufeli (2005) distinguish between work demands and home demands, but do not

include commuting as a demand in its own right. Conversely, Voydanoff (2005a) proposed that boundary-spanning demands should be regarded as a separate category, and she demonstrated that commuting time was a predictor of work-to-family conflict over and above several work-related demands. As the commute can be smooth and unproblematic, but also associated with hassles such as traffic jams matter (Geurts, Beckers, Taris, Kompier, & Smulders, 2009). commuting time alone does not capture all the demands associated with commuting. Nevertheless, even hassle-free commuting, as its time consuming, may be regarded as a demand.

Distinguishing boundary-spanning demands as a separate demand category does, however, leave open the extent to which this type of demand is an independent demand category. Commuting is not formally part of work, but it is closely tied to work for most people (Schneider & Limmer, 2008) and can be seen as a kind of an extension of work time. In line with this, Voydanoff (2005a) listed boundary demands under work-related demands, and Thierry and Jansen (1998) also referred to “work-related time”. To the extent that commuting is a work-related demand, the responsibility for the effort associated with commuting rests not only with the employee but, to a considerable degree, also with the employer; hence one would expect commuting to be associated with attitudes towards the employing organisation, such as organisational commitment, or turnover intention.

Commuting as a source of time-based spillover. Theories on the work-family interface distinguish various types of WFC, one of which is time-based conflict (Allen & Martin, 2017; Greenhaus & Beutell, 1985). As commuting time reduces the time that is available for family, it is an important source of time-based conflict (Koslowsky et al., 1996), and this effect remains even if other commuting demands are low (e.g. one gets a ride to work and has low

concentration demands related to driving). Hence, one would expect longer commutes to increase WFC.

Commuting as a constraint on the flexibility and permeability of the work-home boundary. Boundary theory (Ashforth et al., 2000) and border theory (Clark, 2000) emphasise that flexibility and permeability facilitate transition between work and family and thus reduce segmentation. A long commute makes it difficult to shuttle easily between work and home, thus decreasing both permeability and flexibility and making it more difficult to cope with urgent family responsibilities (e.g., picking up a sick child from kindergarten). One would therefore expect long commutes to increase the risk of WFC.

Commuting as a resource for optimising the work-home boundary. Finally, commuting time may be also seen as useful and beneficial for both work and family domains. According to boundary theory, people seek to minimise the effort required to disengage psychologically and physically from one role and re-enter another (Ashforth et al., 2000). Commuting time could be useful preparation time for entering another role, allowing commuting employees to start unwinding psychologically and shift from one role to another. In this sense, commuting time may be seen as a schematised exit and entry sequence used to disengage from one role and re-engage with another. Such “rites of separation” may involve, for example, switching attention, adopting a role-appropriate cognitive frame (employee vs. other roles, such as husband, partner, and friend) and role-appropriate arousal; they may constitute useful and enjoyable preparation for entry to another role (Ashforth et al., 2000; Hall, 1990; Hall & Richter, 1988). Although the process of disengaging from work has received more attention (Sonnentag, Unger, & Rothe, 2016) the commute may serve to facilitate transitions in both directions. In a recent diary study by Sonnentag and Kühnel (2016) morning reattachment (i.e. mentally

reconnecting to work before actually starting to work) positively predicted work engagement throughout the day.

Commuting and autonomy regarding time and place (temporo-spatial autonomy). Autonomy is an important resource that may buffer effects of stressful conditions (Karasek, 1979). Even though, buffering effects have not been found consistently (Häusser, Mojzisch, Niesel, & Schulz-Hardt, 2010), perhaps because the form of autonomy in question is often not matched to the characteristics of the stressor involved (de Jonge & Dormann, 2006; Häusser et al., 2010; Spector, 2002), the autonomy, or having a say about when and how, is considered es one of the most important resources in different domains (e.g,, recovery). With regard to commuting, having a say about when one works may be helpful because it helps to avoid traffic jams; having a say about where one works may be helpful because it may reduce the number of commutes one makes, thus facilitating adaptation to family demands. Shockley and Allen (2007) referred to this kind of autonomy as time and space flexibility. As flexibility sometimes is used in terms of flexibility of employees on demands of their employer (implying low autonomy), we use the term temporo-spatial autonomy.

We draw two conclusions from this theoretical discussion of the status of commuting. First, commuting may have both positive and negative effects, depending on the theoretical perspective applied. We conclude, however, that the negative effects are likely to predominate, for several reasons, but mainly because neutralisation of the negative, demand aspects, i.e. the reduction of family time and the tendency towards greater segmentation, would require considerable positive compensation. Furthermore, in contrast to the demand and time-for-family aspects of commuting, which are inherently given, it can only provide a good buffer between role identities if the transition is smooth and the commuter has good personal strategies for using

the time for a rite of passage (Ashforth et al., 2000). Also, in many cases, the nature of the two domains may not really require extended transition strategies. Whilst driving home after a stressful workday in anticipation of the continuance of a marital fight on arrival might be regarded as a demanding transition, driving home after a successful workday, anticipating a pleasant climate at home would probably not require an elaborate transition strategy. In other words, in many cases a good transition may well be achieved in a rather short time, and any additional commuting time is likely to contribute to the negative effects of commuting. Second, as commuting is likely to be perceived as work-related, it should affect attitudes to the employer; such attitudes have rarely been investigated in the context of commuting, but our theoretical considerations suggest that they are important.

Previous Research

Commuting and health and wellbeing. It has previously been reported that commuting presents risks to employees' physical and mental health and well-being. Examples are associations between commuting time and greater chest pain and less residential satisfaction in a longitudinal study of American employees (Novaco, Stokols, & Milanesi, 1990); associations between commuting and physical symptoms (e.g., tiredness, digestive disorders, or headaches, but also higher blood pressure), psychological symptoms (e.g., anxiety) and sickness absence in Italian employees (Costa, Pickup, & Di, 1988). Hoehner, Barlow, Allen, and Schootman (2012) found that people with longer than average (i.e. > 22 minutes) commutes reported a lower life satisfaction than non-commuters. Research by the Office for National Statistics of the United Kingdom with over 60.000 respondents showed that commuters had lower overall life satisfaction, lower happiness and more anxiety than non-commuters (UK Office for National Statistics, 2014). In contrast, a recent online survey of Swiss employees (Fichter, 2015) found no

association between life satisfaction and commuting time when commuting was shorter than 50 minutes.

Commuting and WFC. The presumed negative impact of commuting time on work-family balance has primarily been explored in cross-sectional studies (e.g., Geurts et al., 2009). The existing evidence indicates that there is an association, but is not entirely consistent (e.g., Jansen, Kant, Nijhuis, Swaen, & Kristensen, 2004; Voydanoff, 2005b). While some studies show the negative effects of commuting on private life, other shows no effects. For instance, Novaco et al. (1990) found that commuting affected home mood, suggesting that it affects family life. Turcotte (2011) analysed Canada's six largest metropolitan areas and showed that people commuting time was negatively associated with work-family balance and ability to fulfil family responsibilities. Hämmig, Gutzwiller, and Bauer (2009) analysed cross-sectional data from the nationally representative Swiss Household Panel and found that commuting time was one of the variables that affected work-life conflict. Similarly, Voydanoff (2005a) reported that commuting time, like other boundary-spanning demands, was also affecting WFC. In contrast, Geurts et al. (2009) showed that commuting time was not related to work interference with family (WIF) and in the longitudinal study by Jansen et al. (2004) the positive association between commuting time and WFC disappeared after controlling for variance in WFC at baseline. In two studies, negative effects were confined to women (Hofmeister, 2003; Jansen, Kant, Kristensen, & Nijhuis, 2003).

Commuting and work attitudes. Studies exploring the relationship between commuting time and work-related attitudinal variables, such as organisational commitment and intention to quit, are rare. In a study of health professions in three different countries Steinmetz, de Vries, and Tijdens (2014) showed that long commuting time decreased intention to stay with the

employer, being second only to job dissatisfaction, the prototypical predictor of intention to stay (Semmer, Elfering, Baillod, Berset, & Beehr, 2014). Golden (2006) reported that teleworking was negatively associated with turnover intentions and positively related to commitment, which provides indirect evidence for negative relationship between commuting and work attitudes, as teleworking is associated with reduced need for commuting, and with spending less time in the workplace.

Commuting as a resource. We have found no studies demonstrating positive effects of commuting time, so if commuting can represent a resource it seems unlikely that this is its dominant effect. It seems, rather, that the resource properties of commuting may simply serve to attenuate the negative effects of commuting, and only under special circumstances (e.g., smooth traffic; good segmentation strategies, e.g., Van Hooff, 2015).

Commuting and temporo-spatial autonomy. To the authors' knowledge there have been no studies exploring the buffering effects of flexible work arrangements in terms of temporo-spacial autonomy on the negative associations between commuting and health, wellbeing and attitudinal outcomes. Studies have examined the main effects of such flexible work arrangements and sometimes included moderators of these effects. A meta-analysis (Byron, 2005) showed that such flexible work arrangements were associated with less work interference with family (WIF) and (although less strongly) family interference with work (FIW), and that these associations were stronger in women. Shockley and Allen (2007) found that such temporo-spatial flexibility improved work-life balance and that this association was stronger in women with large family responsibilities. Peters, Den Dulk, and van der Lippe (2009) reported temporo-spatial autonomy was only associated with better work-life balance in the case of workers holding part-time jobs with relatively few hours (12–24 hours per week). The meta-analysis by

Mesmer-Magnus and Viswesvaran (2006) indicated that flexible work arrangements had only small and inconsistent effects. A comparison of an international company across countries by Hill, Yang, Hawkins, and Ferris (2004) found that such flexibility was associated with less WFC and similar results were obtained by Anderson, Coffey, and Byerly (2002).

Overall, commuting has been fairly consistently associated with wellbeing; the associations with WFC have been weaker and less consistent. Commuting has not been shown to have main effects as a resource and any such positive impact is likely to be confined to special circumstances. Furthermore, there are indications that temporo-spatial autonomy has positive effects, but it has not been investigated as a potential moderator of the association between commuting and outcome variables. Finally, much of the extant research on commuting uses cross-sectional designs, so there is a need for research estimating effects over time whilst controlling for variance in the baseline levels of outcome variables.

How has commuting been measured in earlier research? There is no standardised definition or operationalisation of commuting time. Researchers have used multiple terms to label this phenomenon, such as *commuting* (Stutzer & Frey, 2008), *job-related spatial mobility* (Schneider & Limmer, 2008) or have referred to people with high or low mobility (Vincent-Geslin, Ravalet, Kaufmann, Viry, & Dubois, 2015). In this study we use the broad definition used by the Swiss Federal Statistical Office (BFS, 2019), which characterises commuters as employees who have a fixed workplace outside of their residential building and describes commuting as the activity of getting to and from work, regardless of the mode of transport. In earlier research, commuting has been operationalised in terms of time or distance, or sometimes in terms of a time-based dichotomous categorisation of commuters versus non-commuters. Costa et al. (1988), for example, defined commuters as those whose commuting time was at least 45

minutes in each direction; all others were classed as non-commuters. Other studies have differentiated between short, medium, long, and very long one-directional commuting times, using various thresholds for long commuting time: more than 38 minutes (Koslowsky et al., 1996), more than 45 minutes (Kirby & LeSage, 2009; Mauss, Jarczok, & Fischer, 2016; Turcotte, 2011), and more than 60 minutes (Hämmig et al., 2009; Vincent-Geslin et al., 2015). Other authors, however, have used commuters' addresses to define commuting distance, for example, a *long commute* has been defined as journey of more than 16 km, or 9.94 miles (Koslowsky et al., 1996) or between 18 and 50 miles (Novaco et al., 1990). However, research has shown that commuting distance is less closely related to outcomes such as health than commuting time (Stutzer & Frey, 2008). In this study, we assessed two-way commuting time and we refrained from defining cut-off values, which should be avoided under most circumstance (MacCallum, Zhang, Preacher, & Rucker, 2002). To our knowledge, previous research on commuting time has mainly relied on self-report data. In a methodological innovation, we used Google Maps (GM) to calculate more objective estimates of commuting time (Google, 2016).

To summarize, in response to inconsistent findings and potential bias in many previous studies the study aims to shed light on the potential effects of commuting on well-being and work attitudes. The study is unique in using more objective data for commuting duration and testing temporo-spatial autonomy as a potential moderator; this should help understand the processes involved and is especially credible because the of the longitudinal design and the large sample and representative at baseline.

Study Hypotheses

We concluded from our review of the theoretical and empirical status of commuting that the demands aspects of commuting outweigh the possible resource aspects and that this is

reflected in the pattern of associations between commuting and wellbeing and WFC. Commuting is predominantly a work-related demand rather than a private demand, rendering organisation-related attitudes a promising outcome variable and so we concluded that temporo-spatial autonomy should moderate the negative effects of commuting on wellbeing and attitudes.

Furthermore, earlier research on commuting time was based on subjective appraisals and we have pointed out the value of using objective measures; we opted to use GM-based estimates of commuting time in our empirical research. We have also pointed out the need for more longitudinal research and our hypotheses refer to the effects of commuting on outcome variables after one year of commuting, after controlling for baseline outcome variables.

H1: Objectively estimated commuting time (GM commuting time) at baseline explains unique variance in WFC at follow-up and the positive association remains significant after controlling for variance in demographic characteristics, private demands, and work stressors at baseline, as well as the baseline level of WFC.

H2: Objectively estimated commuting time (GM commuting time) at baseline explains unique variance in affective commitment at follow-up and the negative association remains significant after controlling for demographic characteristics, private demands, and work stressors at baseline, as well as the baseline level of affective commitment.

H3: Objectively estimated commuting time (GM commuting time) at baseline explains unique variance in intention to quit at follow-up and the positive association remains significant after controlling for demographic characteristics, private demands, and work stressors at baseline, as well as the baseline level of intention to quit.

H4a-H4d: Autonomy, operationalised as the availability of temporally and spatially flexible work arrangements (temporo-spatial autonomy), moderates the relationship

between objectively estimated commuting time (GM commuting time) at baseline and WFC (H4a), affective commitment (H4b), and intention to quit (H4c) at follow-up, such that commuting time is positively associated with WFC and intention to quit and negatively associated with affective commitment more strongly when temporo-spatial autonomy is low, as compared to high.

Method

Participants

The data we used to test our hypotheses came from a sample of N = 3,483 participants that was representative of the Swiss working population in terms of gender, age, education, industrial sector and language region in Switzerland (Igic et al., 2014). At follow-up in 2015 the response rate was 45% (N = 1,562). There were two conditions that had to be met to be included in analyses: First, in order to calculate commuting time from Google maps the postal codes of their home address and their work address has to be different at baseline and follow-up. This condition reduced the sample size from 1,562 to 1,144. Second, even if postal codes of their home address and their work address differed at baseline and follow-up, both postal codes should not change from baseline to follow-up because this would result in a change of commuting time over the course of the year. This condition reduced the sample from 1,144 to 854. Sixteen participants did not report the mode of commuting that is necessary to estimate commuting time with help of Google maps. The final longitudinal sample (N = 838) included 355 women (42.4%). Mean age was 44.8 years (SD = 10.4 years), and 294 participants (35.1%) had a university degree. Most participants (n = 548; 65.4%) lived in the German-speaking part of Switzerland, 165 (19.7 %) lived in the French-speaking part and 125 (14.9%) in the Italian-speaking part. Nearly one in six of the sample (n = 139; 16.6%) did shift work and nearly half of

the sample was in a leadership position (at least one subordinate, 43.4%). Most individuals worked full-time (560, 66.8%), i.e., 42 hours a week; 12.3% of participants worked 50% of a full-time equivalent (FTE) or less; 20.9% worked more than 50 % of an FTE but did not work full-time. The majority of the sample (n = 598, 71.4%) did not have children, 102 (12.2%) had one child, 107 (12.8%) had two children, and 35 (3.6%) had more than two children.

All participants gave informed consent and all responses to questionnaire questions were anonymous. The study was carried out in accordance with the code of ethics of the World Medical Association (Declaration of Helsinki) and the Swiss Society of Psychology. An ethical approval was not necessary because the study was carried out in cooperation with a foundation that acts under government mandate.

Materials and Procedures

Questionnaire. The questionnaire consisted of the so-called "Friendly Work Space Job-Stress-Analysis" (FWS-Job-Stress-Analysis), an online questionnaire based on validated research instruments that organisations can use to gather information about employees' stressors, resources and wellbeing (for further information about FWS-Job-Stress-Analysis, see https://www.fws-jobstressanalysis.ch/).

Work-related demands and resources were measured with the Instrument for Stress-Related Task Analysis (ISTA; Semmer, Zapf, & Dunckel, 1995; see also Irmer, Kern, Schermelleh-Engel, Semmer, & Zapf, 2019)): a) time pressure (four items; e.g., How often are you pressed for time?) and b) task control as a potential resource (six items; e.g., Considering your workplace in general, how much can you change the sequence of the different steps of tasks yourself?). Responses were given on five-point Likert scales ranging from 1 (*very little / to a*

very small degree) to 5 (*very much / to a very large degree*). Information about leadership position, shift work, working hours per week, and postal codes was also collected.

Home demands. "*Quantitative* home demands" were measured with two items (e.g., "Do you have to carry out a lot of tasks at home?") and *emotional* home demands with three items (e.g., "How often do emotional issues arise at home?") (Peeters et al., 2005). Answers were given on a four-point Likert scale ranging from 0 (*never*) to 3 (*always*).

Work-Family-Conflict (WFC). Four items from the Survey Work-Home Interaction - NijmeGen (SWING; Geurts et al., 2005) questionnaire were used to measure WFC (e.g., "Your work schedule makes it difficult for you to fulfil your domestic obligations"). Response options ranged from 0 (*never*) to 3 (*always*) and no explicit time frame was specified.

Affective commitment (AC). *Affective organisational commitment* was measured with four items from the Affective Organisational Commitment scale (Allen & Meyer, 1990) (e.g., "I enjoy discussing my organisation with people outside it"). Responses were given using a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Intention to quit (ITQ) was measured with three items asking for the respondent's estimate of the probability that he or she would still be in the same company six months later and two years later (Bluedorn, 1982), and the probability that he or she would submit an application if informed about an attractive job in another company. Responses were given using a five-point Likert scale, ranging from 1 (*very unlikely*) to 5 (*very likely*).

Temporo-spatial autonomy. We used two items, dealing with temporal autonomy ("I have the freedom to vary my work schedule") and with spatial autonomy ("I have the freedom to work wherever is best for me—at home or at work"). These items were based on a measure

developed by Hyland (2000, cited in Shockley & Allen, 2007) and responses were given on a five-point scale that ranged from 1 (not at all true) to 5 (entirely true).

Commuting time. We used GM, a free web-mapping service developed by Google, to gather objective information about commuting. GM offers route-planning information for travel by car (time and distance), public transport (time plus walking time to and from the station), foot (time and distance) and bicycle (time and distance) based on maps, real-time traffic information and public transport information.

In this paper GM commuting time refers to the fastest time for commuting via the mode of transport reported at follow-up in response to a question about mobility ("How do you usually get to and from your place of work?"; Badland, Schofield, & Schluter, 2007). There were three categories of commuting mode: non-motorised ("bicycle"; "walking"), private motor vehicle ("car"; "car-sharing") and motorised public transport ("public transport - tram or bus"; "public transport - train"). Estimated commuting times may be less accurate for those reporting a combination of modes as the dominant mode was used in the calculation. Dominant mode was determined as follows. We assumed that in commutes involving a combination of non-motorised and motorised transport (e.g. walking to get a bus; cycling to catch a train) the motorised transport accounted for the greater part of the commute. We also assumed that combinations of car and train represented cases where the car was the preferred mode of transportation and the train would be taken if the car was not available (e.g., was needed by the spouse). Only a small proportion of the sample reported exclusively non-motorised commuting (n = 37: bicycle n = 26; walking n = 11), the majority used private motor vehicles (n = 604) or public transport (n = 197).

When mapping postal codes GM uses the geographical centre of each postal code area (Google, 2016). Home and workplace postal codes were amongst of the items of demographic

information that participants were asked to provide, and this information was used to generate estimates of one-way commuting time which were doubled to estimate total daily commuting time.

Baseline GM commuting information was collected between July and December, with data collection ending before public transport timetables changed.

We entered the postal codes into GM manually, searching for journey times with "traffic as usual". Where multiple routes were offered we used the time for the fastest route. Some postal codes referred to a specific address rather than a community (e.g., 1014 refers to *Lausanne Adm cant. VD*), in which case the specific address was used (*Administration Cantonale, 1014 Lausanne*) instead of the postal code where it was located. Whenever the information concerning the postal code was not unambiguous, we determined the correct code using the Swiss Post homepage (Die Schweizerische Post AG, 2016). For postal codes referring to several streets within a city (e.g., 1200 Geneva), the city's name (Geneva) was entered into GM. Because GM commuting times could not be estimated for participants who gave nonexistent postal codes or worked and lived in the same postal code area these participants were excluded from the analysis. The validity of GM commuting time data was estimated by comparing GM commuting time estimates with self-reports of commuting time in a cross-sectional sample of 2805 representative Swiss employees sampled using the same procedure in 2015. The correlation between GM commuting time and self-reported commuting time was $r = .52$.

Online survey. Online surveys were run from 5th to 27th February, 2014 (baseline), and from 10th February to 12th March, 2015 (follow-up), using the LINK Internet panel, which is the largest and most representative online panel in Switzerland, including over 130,000 active members. LINK sent e-mail invitations to its panellists, screened them using demographic

variables, and directed them to FWS-Job-Stress-Analysis. After they had completed the FWS-Job-Stress-Analysis questionnaire, participants were redirected to LINK where they received 200 LINK points as a reward (100 LINK points for 10 minutes, equivalent to approximately 1 Swiss franc, depending on how points are redeemed).

Statistical Analyses

We used IBM SPSS Statistics 23 for all analyses. For multiple regression analysis, we calculated linear regression models using the enter method and centred predictor variables. The multiple linear regression consisted of three steps: Step 1 included baseline outcome variables and control variables (demographic variables; work-related demands and resources; home demands), step 2 included GM commuting time and temporo-spatial autonomy, step 3 included the interaction between GM commuting time and temporo-spatial autonomy. To test the moderation hypotheses, we tested the moderation term in linear regression as well as single slopes using the method described by Cohen, Cohen, West, and Aiken (2013), implemented in an Excel tool for two-way unstandardised simple slope tests (Dawson, 2014; http://www.jeremydawson.co.uk/slopes.htm).

Results

We present general information and correlations first, followed by the results of the multiple linear regression analysis specifying commuting as a unique predictor of WFC, AC and ITQ and assessing the interactions between GM commuting time and temporo-spatial autonomy, AC, and ITQ.

Table 1 shows means, standard deviations, reliability estimates and correlations between study variables. The reliability of temporo-spatial autonomy was rather low (.62) but still acceptable in a scale that consists of only two items. In two-item scales Cronbach alpha may

underestimate reliability (Eisinga, Grotenhuis, & Pelzer, 2013) and coefficients higher than .60 were reported as acceptable (Hair, Black, Babin, Anderson & Tatham, 2006). Table 2 contains the results of the multiple linear regression analyses specifying GM commuting time as a unique predictor of WFC, AC and ITQ (H1-H3). In addition, Table 2 displays the results of the moderator analyses of the interaction between GM commuting time and temporo-spatial autonomy (H4a to H4c).

Descriptive Information and Correlations

First, we conducted dropout analysis of the longitudinal sample to assess whether dropout (i.e., declining to participate in the follow-up survey in 2015 after having participated in the baseline survey in 2014) was related to the measurement process (Diggle & Kenward, 1994). *T*-tests showed some baseline differences between dropouts and other participants: dropouts were younger ($M_{\text{(longitudinal sample)}} = 45.07$; $M_{\text{(dropouts)}} = 40.82$, $p < .001$), reported lower levels of work resources ($M_{\text{(longitudinal sample)}} = 73.14$; $M_{\text{(dropouts)}} = 70.52$, $p < .001$) and fewer work stressors ($M_{\text{(longitudinal sample)}} = 26.61$; $M_{\text{(dropouts)}} = 25.03$, $p < .001$).

Multiple Linear Regression (H1-H3)

We conducted longitudinal multiple linear regression to predict WFC from private demands, work demands and GM commuting time (H1; Table 2). The final regression model showed that GM commuting time was an independent, positive predictor of WFC, although the association was small (H1: $\beta = .056$, $p = .027$). Second, GM commuting time emerged as a small, independent negative predictor of AC (H2: $\beta = -.064$, $p = .016$). Third, GM commuting time emerged as a small, independent positive predictor of ITQ (H3: $\beta = .065$, $p = .016$).

Moderator Analyses (H4a–H4c)

The interaction between GM commuting time and temporo-spatial autonomy was significant for WFC (β = -.050, p = .047, ΔR^2 = .002) and ITQ (β = -.054, p = .049, ΔR^2 = .003), confirming H4a and H4c. H4b was not confirmed as the interaction did not predict AC. Simple slopes were significant for both WFC (t = 2.843, p = .005), and ITQ (t = 2.889, p = .004) when temporo-spatial autonomy was low (-1 SD) but not when it was high (+1 SD) (Figures 1 and 2)

Discussion

This study examined the relationship between WFC and commuting time in two-wave longitudinal data with Swiss employees. The main finding is that commuting times predicted all three outcome variables; it was a positive predictor of WFC and ITC and a negative predictor of AC, and these effects were independent of several work and private stressors. The effect sizes were small, however this was to be expected as we have controlled for the baseline values in outcome variables. Typically the baseline values in outcome variables have large effects, which limits incremental predictive power of commuting times (Ford et al., 2014). For instance, in prediction of ITQ the effect size of commuting time was .11 when ITQ at baseline was not included as predictor. This effect size was reduced to .07 with inclusion of baseline ITQ. Practical significance of small effect sizes is also dependent on the potential consequences of the small effect and the number of individuals who are affected. The number of commuters is quite large and is increasing in most countries, hence small effects do have practical significance.

Two of the effects were qualified by interactions: commuting time affected WFC and ITQ only in the context of lower temporo-spatial autonomy. Thus, with the exception of H4b (interaction regarding AC), all hypotheses were confirmed. Noteworthy, temporo-spatial autonomy buffered the stressor-strain association in WFC and ITQ, but did not predict AC nor buffer the association between commuting time and AC as a positive outcome. Further studies

should explore whether temporo-spatial autonomy systematically protects from commuting related drains of well-being while positive work attitudes are unaffected.

These results were obtained using objective estimates of commuting time from GM; these estimates correlated rather strongly with self-report data, although the correlation was not so high as to suggest that the two measures are substitutable. Although objective estimates of commuting times are not error-free, they lack the bias often found in self-report data (e.g., problems experienced during recent commutes assume undue salience; see Schwarz & Oyserman, 2001). As both the commuting measure and the outcome variables contain errors, which are uncorrelated, any bias involved likely leads to associations being underestimated. In Switzerland mean commuting time for one way was 31 min in 2017 (BFS, 2019) that is estimated 62 min for both, the way to work and back home. In the 2015 crossectional data the mean level of GM commuting time for both, the way to work and back home was 54.4 min (*SD* = 35.0 min.). The self-reported commuting time was in average 52.3 minutes (*SD* = 43.5). While mean commuting time is rather similar for GM estimates and self-reported commuting time – and are only a bit smaller than the average value reported by the Swiss bureau of statistics in 2017, the self-report commuting data in the current study seem to have a bit more variation than the GM data that might be partly reflect self-reporting bias.

The Status of Commuting

Our discussion of commuting led us to conclude that the demand aspect is clearly dominant, as commuting can itself be regarded as a demand and commuting time detracts from family time and appeared likely to induce WFC. In contrast, we expected the resource value of commuting, i.e. facilitation of boundary management, to be comparatively low and confined to special circumstances. Overall, our results are in line with this reasoning. Hence, considering

participants who changed their home and/or work place during the study period should be expected to reduce commuting time. Change of work postal code while home postal code was left unchanged was observed in 262 participants. Change of home postal code while work postal code was the same was observed in 101 participants. Fortyfour participants changed their home and work postal code. In addition to a change in postal code, a change of means of commuting (public transport, car, etc.) may also have an influence on a change in commuting time. We know how participants commuted during the study period but we do not know how they commuted before baseline. We therefore tested the fastest connection possible that was estimated by Google maps between home and work at baseline and at follow-up and expected that if commuting time is a reason to change the home address and/or place of work, the fastest connection would be a good if not the best indicator. Notworthy, there was no overall change in mean commuting time in those who changed their postal code in the follow up year ($t(275) = 0.98$, $p = .329$). In Switzerland mean commuting time for one way was 31 min in 2017 (BFS, 2019). The picture looks different if we analyses changes in commuting time in short (lower or equal 31 minutes commute) versus long commuters (longer than 31 minutes). In short commuters commuting time significantly increases from 16.1 minutes at baseline to 21.3 minutes at follow-up ($t(205) = -3.78$, $p < .01$). However, if we looked at long commuters at baseline (those who had more than the mean of 31 minutes commuting time at baseline), a change in postal code of their home address significantly reduced their commuting time from 53.6 min to 44.3 min ($t(69) = 2.11$, $p = .038$). Thus, in our view, in those with a large burden of commuting efforts, we see the intent to reduce their commuting time because it is experienced as demanding stressor. However, other concepts that were not taken into account in the current study may play a role, too. For instance, the associations found may be stronger for individuals showing poor and moderate boundary

management, whereas good boundary management may attenuate the impact of commuting times on WFC.

In general, resources may have main effects (i.e. contribute to goal achievement, or have intrinsic value) or they may have buffering effects (Bakker & Demerouti, 2016; Hobfoll, 2001). To the extent that commuting time serves as a resource, our results imply that this reflects mitigation of the stressful aspects of commuting rather than independent positive effects. Commuting should, therefore, be regarded first and foremost as a stressor.

We also concluded from our theoretical considerations that commuting is probably perceived as job-related demand and so we focused on the prediction by commuting time of two neglected organisational outcome variables: AC and ITQ. Our results were in line with our expectations and suggest that organisation-related outcomes should receive more attention in future research.

Finally, we argued that autonomy that is specifically related to commuting, that is, temporo-spatial flexibility, would be a valuable resource in this context. As expected, temporo-spatial autonomy predicted two of the outcome variables, WFC and ITQ, and interacted with commuting time in predicting these two outcomes such that commuting time only predicted WFC and ITQ in the context of low temporo-spatial autonomy. Note that job control, which relates to the way one goes about one's work, but does not refer to control over commuting times, did not predict any of the outcomes, although it was close to being significant for AC (p = .06). These results support the argument that only control over the stressor in question can mitigate its negative effects (Spector, 2002) and, more generally, that resources should match the stressor (de Jonge & Dormann, 2006).

Limitations

Dropout analysis showed that individuals who provided follow-up data had more resources at baseline and more work stressors than participants who dropped out. This sampling bias may reflect a more restrictive reporting style in dropouts. Potential bias may also arise from exclusion of so many participants because they worked at the same postal area where they lived and those who changed the place of work or living or both. The 838 final participants differed from excluded participants in being slightly younger than others; they also show slightly lower AC and slightly lower intention to quit; they tend to work a bit more frequent in shift schedules, and their commuting times at baseline (compared to those who commute but changed postal codes between baseline and follow-up) were a bit smaller. However, these differences were very small and significant differences appear because of the large numbers. Furthermore, we did not ask for how long participants had been commuting to work. Self-selection effects or accommodation effects may have occurred. Another limitation is that our measure of commuting referred to time only and did not consider additional characteristics such as traffic jams, what may be relevant when commuting by car.

The use of objective data can be regarded as a strength of the study, but these data have their own limitations. First, we had to make some assumptions when estimating the commuting times of participants who reported combining several modes of transport and our estimates are likely to be less precise in these cases. Second, GM estimates the fastest route with “traffic, as usual“. In Switzerland, where the public transport is very reliable and on time, we do not expect public transport estimates to be biased, however, in some other countries that may not be the case. Nevertheless, the estimates of the time by car may indeed be somewhat biased, as we were only able to consider information on “traffic, as usual“. Third, using postal code as an indicator of location limits precision, because the codes describe areas that vary in size.

Given the theoretical discussion about commuting as a resource, the most important limitation of our study is probably that we do not have any information on participants' boundary management strategies. This lack of information is because the study was not focused on boundary management and there was a limit to the number of questions that could be posed to participants. Our conclusions regarding boundary management are therefore limited. On the other hand, the large sample is a strength of our study.

Theoretical and Practical Implications

Fichter (2015) pointed out that research on commuting needs to consider variables other than commuting time if the complexity of the phenomenon is to be analysed. Our study included several work-related and private stressors and resources. Future research would benefit from including more commuting information in order to gain insight into the process of commuting. Such information could include perception of the commuting experience (e.g., commuting satisfaction or disturbing aspects of commuting); activities carried out whilst commuting by public transport (Fichter, 2015; Weichbrodt, Tanner, Josef, & Schulze, 2015); number of weekly commutes (Vincent-Geslin et al., 2015); use of multiple modes during a commute and rush-hour commuting (Fichter, 2015; Weichbrodt et al., 2015). In addition more attention should be paid to the effects of using the commute for working; some authors have mentioned positive effects of working while commuting (Fichter, 2015; Mauss et al., 2016; Weichbrodt et al., 2015); but doing this may involve additional demands. Furthermore, it might be interesting to ask participants to give their reasons for their choice of commuting mode(s) and describe the degree of freedom they have in choosing commuting options.

Although the effects do not seem dramatic, commuting does have consequences for family life and for organisations. A fast and reliable transport infrastructure is, therefore,

important. Organisations can mitigate the effects of commuting by giving employees a degree of flexibility over when and where they work. It is important to note that whilst this kind of flexibility can be written into company policy it must also be embedded in a supportive culture, lest employees hesitate to use options that are officially available (Anderson et al., 2002).

Disclosure of conflict of interest

The authors declare there are no conflicts of interest.

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Table 1. Means standard deviations, and correlations between study variables (part 1)

Scale	M	SD	α	1	2	3	4	5	6	7	8
(1) Baseline WFC	0.56	0.52	0.76								
(2) Baseline AC	4.97	1.39	0.86	-.12***							
(3) Baseline ITQ	2.03	0.79	0.69	.23***	-.48***						
(4) Follow-up WFC	0.57	0.55	0.80	.66***	-.04	.10**					
(5) Follow-up AC	5.07	1.33	0.84	-.12***	.63***	-.45***	-.09**				
(6) Follow-up ITQ	2.16	0.93	0.72	.21***	-.41***	.61***	.16***	-.55***			
(7) Baseline GM commuting time [min]	58	44.52	n.a.	-.01	-.03	.05	.02	-.07*	.08*		
(8) Follow-up temporo-spatial autonomy	2.52	1.10	0.62	-.04	.23***	-.14***	-.08*	.19***	-.16***	.08*	
(9) Follow-up emotional home demands	0.87	0.58	0.77	.23***	-.09**	.23***	.26***	-.14***	.19***	-.07*	-.07*
(10) Follow-up quantitative home demands	1.35	0.67	0.75	.23***	-.06	.15***	.29***	-.07*	.14***	-.09**	-.08*
(11) Baseline time pressure	3.11	0.83	0.82	.46***	-.005	.11**	.42***	.02	.06	-.05	.048
(12) Baseline task control	3.90	0.80	0.85	-.11**	.28***	-.26***	-.09*	.26***	-.21***	<.01	.57***
(13) CHF [19.7% yes]	n.a.	n.a.	n.a.	.05	-.03	.01	.05	-.09*	.01	-.02	-.08*
(14) CHI [14.9% yes]	n.a.	n.a.	n.a.	.12***	.06	.04	.12***	.09*	.001	.03	-.02
(15) Baseline age	44.83	10.37	n.a.	-.09**	.08*	-.14***	-.08*	.16***	-.16***	.01	.08*
(16) Sex [57.6% men]	n.a.	n.a.	n.a.	.04	.07	-.03	.03	.13***	-.05	.03	.19***
(17) Education	3.44	1.68	n.a.	.06	-.03	.05	.09**	-.06	.07*	.03	.07
(18) Children [28.6% yes]	n.a.	n.a.	n.a.	.01	.04	<.01	.06	.03	.03	-.04	.04
(19) % of employment [% FTE]	87.73	20.91	n.a.	.16***	.06	-.01	.14***	.09**	-.02	<.01	.11**
(20) Baseline leadership position [43.4% yes]	n.a.	n.a.	n.a.	.07*	.26***	-.10**	.08*	.24***	-.11**	-.08*	.21***
(21) Baseline shift work [16.6% yes]	n.a.	n.a.	n.a.	.08*	-.05	.02	.09*	-.05	.00	-.03	-.15***

Note. N = 838. WFC = work-family conflict; AC = affective commitment; ITQ = intention to quit; CHF = French-speaking part of Switzerland (CH); CHI = Italian-speaking CH; FTE = Full Time Equivalent. *p < .05, **p < .01, ***p < .001, two-tailed.

Table 1. Means standard deviations, and correlations between study variables (part 2)

Scale	9	10	11	12	13	14	15	16	17	18	19	20
(1) Baseline WFC												
(2) Baseline AC												
(3) Baseline ITQ												
(4) Follow-up WFC												
(5) Follow-up AC												
(6) Follow-up ITQ												
(7) Baseline GM commuting time [min]												
(8) Follow-up temporo-spatial autonomy												
(9) Follow-up emotional home demands												
(10) Follow-up quantitative home demands	.35***											
(11) Baseline time pressure	.08*	.11***										
(12) Baseline task control	-.10**	-.08*	-.02									
(13) CHF [19.7% yes]	.08*	.05	-.05	.02								
(14) CHI [14.9% yes]	-.02	.12***	.04	.03	-.21***							
(15) Baseline age	-.07*	-.14***	.04	.10**	-.03	-.06						
(16) Sex [57.6% men]	-.06	-.33***	.10**	.09**	.04	.01	.10**					
(17) Education	.03	.03	.07	.05	-.004	-.03	-.12***	.01				
(18) Children [28.6% yes]	.18***	.19***	-.02	.03	.08*	.02	-.15**	.07	<.01			
(19) % of employment [% FTE]	-.11**	-.26***	.20***	.12***	.03	.05	-.06	.52***	.01	-.15***		
(20) Baseline leadership position [43.4% yes]	-.02	-.10**	.16***	.32***	-.05	.09**	.14***	.26***	.02	0.04	.25***	
(21) Baseline shift work [16.6% yes]	-.02	.03	.03	-.19***	.26***	-.01	.04	.03	-.05	0.02	-.04	<.01

Note. N = 838. WFC = work-family conflict; AC = affective commitment; ITQ = intention to quit; CHF = French-speaking part of Switzerland (CH); CHI = Italian-speaking CH; FTE = Full Time Equivalent. *p < .05, **p < .01, ***p < .001, two-tailed.

Table 2. Multiple regression analysis using Google Maps estimates of commuting time to predict WFC, AC and ITQ at follow-up (coefficients of the final regression model).

	WFC				AC				ITQ			
	β	t	*p*	Tol	β	t	*p*	Tol	β	t	*p*	Tol
Dependent variable baseline	0.51	17.13	.000	.69	0.59	20.95	.000	.87	0.57	19.69	.000	.86
French-speaking CH	0.01	0.17	.867	.84	-0.06	-2.02	.043	.85	-0.01	-0.35	.728	.84
Italian-speaking CH	0.04	1.38	.167	.90	0.03	1.22	.224	.91	-0.03	-0.90	.371	.91
Baseline age	<0.01	0.13	.901	.87	0.09	3.22	.001	.87	-0.05	-1.84	.067	.87
Sex [0 = female, 1 = male]	<0.01	-0.01	.990	.61	0.07	2.08	.038	.61	<0.01	-0.07	.946	.61
Education	0.05	1.86	.063	.97	-0.03	-1.05	.294	.97	0.04	1.47	.142	.97
Follow-up emotional home demands	0.09	3.14	.002	.82	-0.08	-2.89	.004	.<84	0.04	1.47	.143	.81
Follow-up quantitative home demands	0.14	4.51	.000	.70	0.03	0.99	.325	.71	0.02	0.58	.565	.71
Children [no, yes]	0.03	1.21	.227	.85	0.02	0.68	.499	.85	0.02	0.67	.505	.85
% of employment [% FTE]	0.08	2.62	.009	.61	0.02	0.65	.519	.62	0.01	0.32	.753	.62
Leadership position	0.02	0.73	.464	.78	0.02	0.66	.508	.76	-0.03	-0.92	.361	.78
Shift work	0.04	1.44	.150	.87	-0.01	-0.20	.845	.87	-0.01	-0.46	.645	.87
Baseline time pressure	0.14	4.94	.000	.73	<-0.01	-0.08	.940	.89	0.01	0.34	.735	.88
Baseline task control	0.02	0.59	.556	.58	0.07	1.92	.055	.58	-0.01	-0.23	.818	.57
GM commuting time [min]	0.06	2.22	.027	.96	-0.06	-2.42	.016	.96	0.07	2.34	.020	.96
Temporo-spatial autonomy	-0.07	-2.36	.019	.63	-0.01	-0.21	.833	.63	-0.07	-2.19	.029	.63
GM commuting time x temporo-spatial autonomy	-0.05	-1.99	.047	.98	0.02	0.92	.360	.98	-0.05	-1.97	.049	.98

Note. FTE = Full Time Equivalent, β = standardised coefficient, Tol = tolerance, percentage of variance in predictor variable that is not explained by other predictor variables, small values (<.20) indicate a potential problem with multicolinearity (Hair et al., 2010). *N* =

838; WFC: Model1: R^2 =.485, Adj. R^2 =.476, Model 2: R^2 =.490, Adj. R^2 =.481, F(2,821) = 4.47, ΔR^2 = .006 for step 2, p = .012, Model 3: R^2 =.493, Adj. R^2 = . 482, F(1,820) = 3.97, ΔR^2 = .002 for step 3, p = .047. AC: Model 1: R^2 =.436, Adj. R^2 =.427, Model 2: R^2 =.440, Adj. R^2 =.429, F(2,821) = 2.91, ΔR^2 = .004 for step 2, p = .055, Model 3: R^2 =.441, Adj. R^2 = . 429, F(1,820) = 0.84, ΔR^2 = .001 for step 3, p = .360; ITQ: Model 1: R^2 =.390, Adj. R^2 =.380, Model 2: R^2 =.397, Adj. R^2 =.385, F(2,821) = 4.37, ΔR^2 = .006 for step 2, p = .013, Model 3: R^2 =.400, Adj. R^2 = . 387, F(1,820) = 3.87, ΔR^2 = .003 for step 3, p = .049.

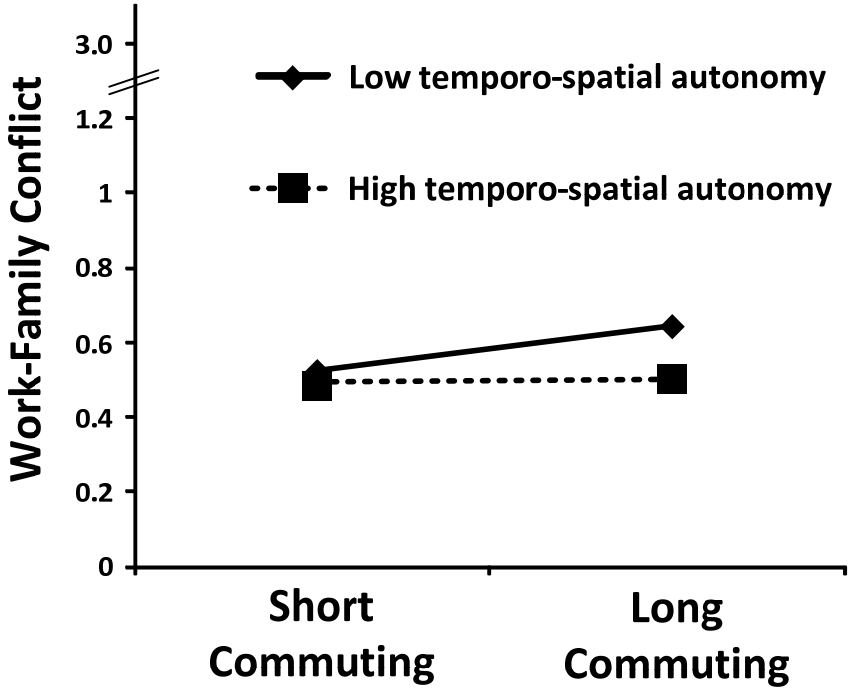

Figure 1. Temporo-spatial autonomy - as a moderator of the relationship between objectively estimated commuting times (GM commuting time) at baseline and WFC at follow-up (H4a).

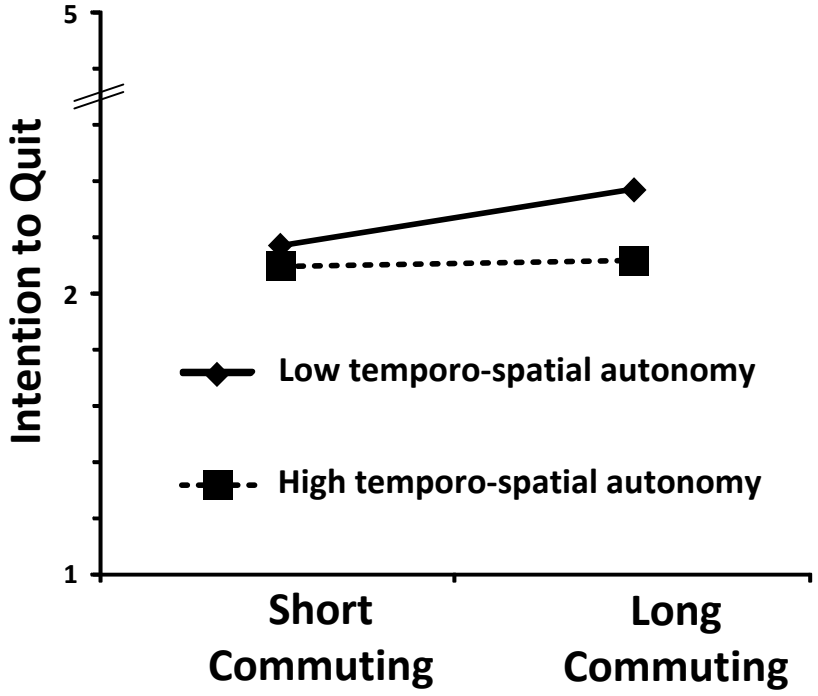

Figure 2. Temporo-spatial autonomy - as a moderator of the relationship between objectively estimated commuting times (GM commuting time) at baseline and intention to quit at follow-up (H4c)